1. Evaluate each expression below or explain why they do not exist.

$$A = \begin{bmatrix} 1 & -1 & 2 \\ 2 & 0 & 5 \end{bmatrix}, \qquad B = \begin{bmatrix} -1 & 2 & 3 \\ 1 & -1 & 1 \\ 0 & 1 & 1 \\ 3 & 2 & 1 \end{bmatrix}, \qquad C = \begin{bmatrix} 2 & -1 & 2 \\ 5 & -2 & 1 \end{bmatrix},$$

$$x = \begin{bmatrix} 2 \\ 1 \\ -1 \end{bmatrix}, \qquad y = \begin{bmatrix} 3 \\ 2 \\ 0 \\ 2 \end{bmatrix}, \qquad z = \begin{bmatrix} 5 & 0 & 1 \end{bmatrix}$$

   (a) $3A - 2B$
   (b) $3A - 2C$
   (c) Ax
   (d) By
   (e) Cz
   (f) $Ax + Cz^T$
   (g) $B^T y + z^T$

2. Suppose $x = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$. Find a matrix A such that

   (a) $Ax = \begin{bmatrix} 0 \\ 0 \\ 3 \end{bmatrix}$
   (b) $Ax = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$
   (c) $Ax = \begin{bmatrix} 3 \\ 2 \\ 3 \\ 4 \end{bmatrix}$

3. Write the question below into a question with the form $Ax = y$.

   Are the vectors $\begin{bmatrix} 1 \\ 1 \\ 2 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 1 \\ -2 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ -1 \\ -1 \end{bmatrix}, \begin{bmatrix} 2 \\ -1 \\ -1 \\ 3 \end{bmatrix}$ linearly independent?

   NOTE: You are not asked to answer the question. You are asked to rephrase it using matrix-vector multiplication.